Baker (H. A.)

AN APPLIANCE

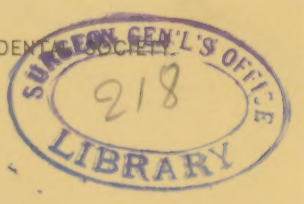
FOR

CONGENITAL CLEFT PALATE.

BY

HENRY A. BAKER, D.D.S.,
LECTURER ON ORAL DEFORMITIES, BOSTON DENTAL COLLEGE.

READ BEFORE THE MASSACHUSETTS DENTAL SOCIETY.



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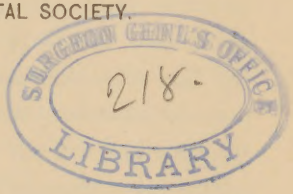

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AN APPLIANCE FOR CONGENITAL CLEFT PALATE.

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(Read before the Massachusetts Dental Society, December 9, 1880.)

One of the most distressing deformities which the dental practitioner is called upon to treat is that which is known by the name of *cleft palate*. This peculiar and unfortunate malformation is sometimes caused by accident or disease, and in other cases it dates from birth; and from the manner of its origin it is classed either as accidental or congenital. But whatever may have been the origin of the trouble, the same phenomena often occur as common to both classes; although, even when the openings presented are precisely similar in form, the methods of treating cases of these two varieties are naturally very different. A case of accidental cleft palate may be successfully treated with a very simple appliance, while the same amount of skill exercised on a congenital cleft would have no beneficial result. This may be accounted for by the fact that in the former case the patient had learned to articulate distinctly and use the organs of speech efficiently and correctly, while persons who are thus deformed from birth are obliged to learn the art and methods of articulation by slow and painful processes. The organs require the training which is necessary for one who acquires a new language. Hence the appliance for relief should not only fill up the gap in the defective palate, but should also be so constructed as to work on physiological principles in harmony with the natural movements, —that is to say, it should be under the perfect control of the surrounding muscles. It is manifest, therefore, that the success even of the most scientifically-adjusted instrument depends largely upon the co-operation of the patient who uses it.

Nearly three hundred years have passed since the attention of scientific persons was first directed to these phenomena of palatal malformation and the primitive appliances were formed for their

relief. These instruments were termed *obturators* (from the Latin word *obturare*, "to stop up"), and were made from rolls of cotton, pieces of sponge, etc., etc. A wide interval of years, and the researches of many patient and industrious dentists, separate the era of these crude and unsatisfactory attempts from the perfected scientific appliances of Dr. Suersen. The most important and significant advance in this department of science made itself manifest in attempts at the formation of an artificial *velum*, and Dr. Stearns was probably the first to introduce its true principle. I speak of these two investigators—Suersen and Stearns—because I am led to think that they have brought before the profession the most scientific apparatus of each class, and it is from a consideration of both of their appliances that I have evolved the principle of my own, in explanation of which this paper has been prepared.

In 1867, Dr. Suersen described before the Central Association of German Dentists, at Hamburg, his method of constructing obturators. In December, of the same year, a report of his lecture was published in the *American Journal of Dental Science*. In *Johnston's Dental Miscellany* for December, 1877, Dr. Kingsley's history of obturators gives an abstract of the same, and I deem it best to use Suersen's language in describing his obturator, quoting from Kingsley's late work on "Oral Deformities:"

"In order to be able to pronounce all letters distinctly, it is accordingly necessary to separate the cavity of the mouth from the cavity of the nose by means of muscular motion. That separation is, under normal conditions, effected, on the one hand by the velum palati, which strains itself (consequently by the levator and tensor palati); but, on the other hand, also by a muscle which, to my knowledge, has not yet received a sufficient amount of attention in connection with these operations,—I mean the *constrictor pharyngeus superior*. This muscle contracts itself during the utterance of every letter pronounced without a nasal sound, just as the levator palati does. The constrictor muscle contracts the cavum pharyngo-palatum, the pharynx wall bulging out; and it is chiefly on the action of this muscle that I base the system of my artificial palates.

"These palates, which in all their parts are made of hard caoutchouc, consist of a tooth plate suitably attached to existing teeth,

and which, at the same time, covers the fissure in the hard palate, (if such a fissure exists.) Where the fissure commences in the velum, that plate terminates in an apophysis broad enough for filling up the defect. This apophysis is at the same time of such thickness as to keep up a contact between the high edges forming the sides of the apophysis and the two halves of the velum, even when the levator palati is in activity. To bring about this contact the more surely, the high edges forming the sides do not rise straight, but obliquely towards the outside. The lower surface of the apophysis, turned towards the mouth, lies on about an equal level with the velum, *if the latter is raised by the levator palati.* But when the velum hangs loosely downward, the back part of the artificial palate is lying over it. This back part accordingly fills up the cavum pharyngo-palatum, and in such a manner as not to impede the entrance of the air into the cavity of the nose when the constrictor pharyngeus superior is inactive. Thus the patients can, without any impediment, breathe through the nose. But as soon as the constrictor contracts the cavum pharyngo-palati (this happens, as I will repeat for the sake of clearness, in the utterance of every letter, with the exception of *m* and *n*), the muscle already named reclines against the vertical back surfaces of the obturator. By this operation the air-current is prevented from entering the cavity of the nose, and compelled to take its way through the mouth, and thus the utterance loses its nasal sound. To the existence of those vertical surfaces, and consequently to the thickness of that part of my palates which fills up the fissure in the soft palate and the cavum pharyngo-palatum, I must attach special importance. But for that thickness, the levator palati, when it rises upward, would not remain in contact with the side edges of the obturator, nor would the constrictor pharyngeus be able to effect a sufficient termination if the portion of the obturator nearest to it consisted only of a thin plate."

A great many practitioners, in treating a fissured palate, simply separate the nasal and buccal cavities by a thin plate, thinking that the separation is all that is required. Some even make a great parade of this device, claiming it to be an improvement over any other appliance. A little reflection will show this to be impossible, as I shall endeavor to explain before closing this paper. I

wish to go back and repeat what Suersen says: "In order to be able to pronounce all letters distinctly, it is accordingly necessary to separate the cavity of the mouth from the cavity of the nose by means of muscular motion. That separation is, under normal conditions, effected on the one hand by the velum palati which strains itself (consequently by the levator and tensor palati)."

It will be noticed that he admits that the levator palati is an important organ of speech, yet he makes no provision for utilizing it as such, and only provides for the superior constrictor muscle coming in contact with the distal surface of his appliance, to shut off the nasal passage. In my opinion, for the patient afflicted with congenital cleft to acquire perfect articulation with such an appliance (even if it be possible), years of application and training of this muscle would be necessary. A little reflection will show that this muscle, besides performing its own function, must be trained to fulfill those of the velum palati, levator palati, and tensor palati. But in an accidental lesion this may be all that is necessary, as the patient, having previously learned to articulate distinctly, and having this deformity come upon him afterwards, the superior constrictor muscle would no doubt be sufficiently developed to perform that function.

Sir Wm. Fergusson, in his report of a dissection made by him of a cleft palate in 1844, states distinctly that the superior constrictor was very full; and he also claimed for that muscle very decided forward action in deglutition. I am of the opinion that his dissection was of an accidental (not a congenital) case, after that development had taken place.

It was in the years 1841 and 1842 that Dr. Stearns made his first artificial velum.

In 1860, Dr. N. W. Kingsley came into the field and took up Dr. Stearns's appliance. Finding it too complicated for the general practitioner to construct, and too expensive when completed for those in ordinary circumstances, he was led to serious thought in regard to modifying its production; but he still adhered to the same principle of utilizing the levator muscle. Dr. Kingsley says, respecting Dr. Stearns's appliance:

"Two principles were vital to Dr. Stearns's instrument, namely,

First, the artificial velum should embrace the levator muscles of the palate, so that it could be lifted by them; and second, that it should bridge the upper pharynx behind the uvula and cut off nasal communication at will."

Dr. Kingsley's modification of Stearns's instrument consisted chiefly in leaving off the triple form and doing away with the central slit, the flap, and the springs. The simplified form consisted of two leaves of soft vulcanized rubber, connected in the median line, the palatal portion running down to the uvula and then bridging across at that point, and the nasal portion reaching across the pharynx. Instead of the appliance being made in sections, so as to slide across each other, as in the Stearns, the bifurcated uvula slides between the two leaves, and the levator muscles of the palate lift it up to meet the pharynx, thus shutting off the nasal passage.

It will be noticed that in this simplified form the Stearns principles are fully carried out, and to Dr. Kingsley that credit is due. His claims to originality are in the simplifying of the Stearns instrument.

Dr. Kingsley says: "An important principle enunciated by Dr. Stearns as essential to the success of all artificial vela for congenital cleft was, that the instrument filling the fissure in the natural palate must be of the nature of a valve under the control of the muscles surrounding it, and so arranged that it could be elevated by them, thus shuting off the nasal passage, as is absolutely essential in the production of certain sounds belonging to articulate language. This principle was carried out by him, first, in the character of the material chosen being of a yielding, elastic nature; and second, in the form being made to embrace the levator muscles and subject to their control."

Dr. Kingsley, in speaking of Suersen's appliance, says:

"First. That of all obturators this is the best form for a congenital fissure; but, while the wearer is enabled to articulate with such an instrument, it is only *after* he has learned articulation with another apparatus.

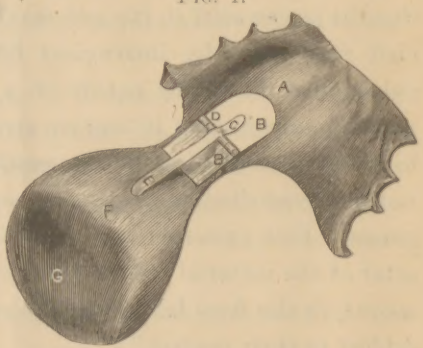
"Second. That a soft, elastic, artificial velum is much better adapted to the acquirement of articulation than an unyielding, nonelastic substance, but when acquired, an obturator may be substituted.

"Third. That in very rare cases articulation may be acquired with an obturator only; but it is the result of the extra activity of the pharyngeal muscles, while with the elastic velum the levators of the palate contribute largely."

My own experience with soft vulcanized rubber for an artificial velum is, that if it would resist the fluids of the mouth and not go through a process of decay and roll out of shape,—in short, if it could be made permanent, it would be all that could be desired. Since this is impossible, I do not hesitate to say that it is a very objectionable material, and I have been led to long and careful meditation regarding it. I have been striving for the past five years to provide an artificial appliance, with hard rubber, carrying out the Stearns principle, whereby I could utilize the levator muscles to control the movement of the appliance, and with which articulation could be learned as well as with the soft rubber.

My studies and experiences have induced me to settle upon the following device, which consists of a gold or hard rubber plate (A, Fig. 1), covering the roof of the mouth, down to the junction of the hard and soft palates. From this point the artificial velum, F, extends back and downward, restoring the symmetry of the palatal surface by bridging across and lying upon the muscles of each side. The distal surface, G, or that portion coming in contact with the pharyngeal wall, is quite broad, and so constructed as to articulate perfectly with this surface, while the constrictor muscle contracts and closes around it on a semicircle. This is the Suersen principle, and the main ideas I take from that appliance.

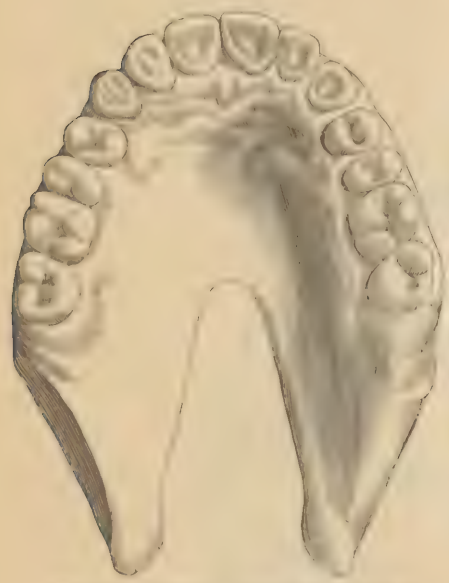
FIG. 1.



The velum is of polished hard rubber, gold, or platinum, and much resembles a chestnut in form. It is attached to the plate with a hinge-joint, B, B, thus giving free movement at the junction of the hard and soft palates. Fastened to the upper surface of the plate is a delicate, platinized gold spring, C, which bridges across

the joint, and, resting on the velum at E with a slight downward pressure, serves to keep the latter in contact with the levator muscles when in action, thus giving perfect control of the appliance. The spring necessarily must be very delicate, so as not to resist the muscular movement. At the junction of the hard and soft palates there is a stop, which prevents any downward pressure upon the muscles when in a relaxed condition. The bulb-like form of the velum (see D, Fig. 4) necessitated a thickness which would

FIG. 2.



The cleft, extending a little beyond the soft into the hard palate.

FIG. 3.

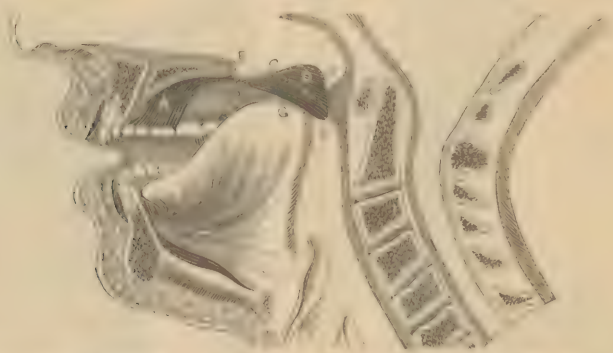
Appliance in position: A, the plate; B, the stop, preventing any downward pressure when the muscles are in a relaxed condition; C, the artificial velum; D, D, muscle lying under it, the dotted lines showing the appliance resting on the muscles.

naturally have made it quite heavy, and, as the resultant weight would be a serious objection, I was, of course, desirous of overcoming the difficulty. A suggestion happily came to my relief in this way: While in a drug-store I accidentally took up a hard rubber truss made by a Philadelphia firm, discovering that the pad was made hollow. I thereupon wrote to the manufacturers, asking them if they would inform me how they prepared the rubber in that way. In their reply I found that the method was quite simple. It is as fol-

lows: Take the vulcanite rubber in the soft state and cut the sheets so that when joined together the desired form is given. Then a little water is dropped into the cavity (I found it better to add a little alcohol), the edges are sealed, and the piece vulcanized in the usual way. The steam produced by the water and alcohol inside creates sufficient pressure to keep the walls distended. By this method the appliance that the cuts were taken from which illustrate this article was made so light that it would not sink when put in water.

In treating a case by Kingsley's method I was obliged to use a hinge-joint to bridge over a union by staphyloraphy. I found in that case that the appliance was much better controlled by the surround-

FIG. 4.



The artificial palate thrown up by the muscles, E, E, as in all sounds requiring the closure of the nasal passage; F, the superior constrictor muscle advanced to meet it; G, the tongue, raised, pressing hard against the appliance, as in pronouncing the letter *k* or *g*; A, the plate; B, the hinge-joint and stop; C, the spring resting on the velum.

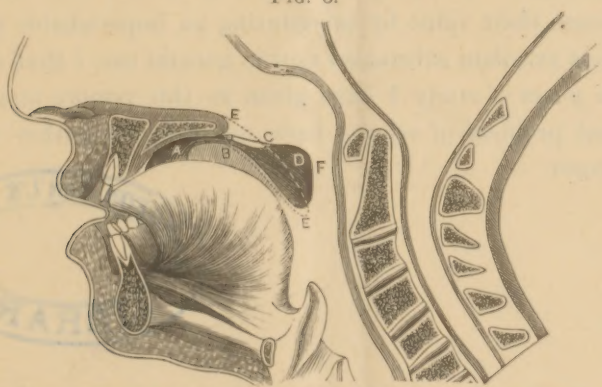
ing muscles, and saw a much more rapid progress in acquiring articulate speech. This led me to more fully provide for that muscular movement, and I will endeavor to give the reasons why this should be done. As we have before quoted from Suersen, in order to pronounce all letters distinctly it is necessary to separate the cavity of the mouth from that of the nose by muscular action, and to close the nasal passage in pronouncing every letter, except *m* and *n*. This can be demonstrated by holding the nose while endeavoring to pronounce all the letters as plainly as possible.

In studying the mechanism of speech we learn that more than three-fourths of the sounds of articulate language depend upon the integrity of the soft palate for their perfect enunciation. This

being the fact, articulation with a rigid obturator must be extremely difficult to acquire. If three-fourths of the sounds depend upon the free movement of the natural palate, it seems to me a sufficient reason why we should provide for that movement in an artificial one.

Dr. Kingsley says, that with a yielding appliance the levators of the palate contribute largely to correct speech. The surrounding muscles have control over my appliance in the following way: The artificial velum bridges across the opening and lies upon the muscles of either side. (See Fig. 3, D, D.) With all sounds requiring the closure of the nasal passage it is thrown up (D, Fig. 4) by the levator muscles, there being no resistance except that of the delicate gold spring, C, which preserves the contact of the velum with the muscles. The thickness of the velum brings its posterior surface in close apposition with the superior constrictor muscle, F, and thereby affords, in the pronunciation of the gutturals, a firmer resistance to the pressure of the tongue, G, than can be obtained with a thin obturator. By the presence of the hinge, B, the above

FIG. 5.



The muscles relaxed, the appliance descended, thus giving a free passage for nasal sounds and respiration.

movements are rendered so free and easy that there is no tendency to any displacement of the plate, such as occurs with a rigid appliance. If a nasal sound immediately follows a guttural, the descent of the velum is rendered certain and accelerated by the pressure of the spring above.

To accomplish the above with a material that would be permanent was a problem very difficult of solution. Of course, it is impossible

to give to a piece of mechanism muscular power, but it should be made movable so as to be acted upon by, and be under perfect control of, the muscles surrounding it.

I claim the following advantages for my appliance:

First. That it is made of a permanent material.

Second. That articulation can be learned with it more readily than with any other appliance.

Third. That it is much easier to make. For a soft rubber appliance perfect models of both the hard and soft palates are required, as well as of the nasal portion of the soft palate; also metal molds are essential to vulcanize each case.

Thus the cotton-rolls of the mediæval surgeons are replaced with artificial organs of precision, working upon physiological principles. The ingenious appliances of our distinguished fellow-professionals, Suersen, Stearns, and Kingsley, whose scientific attainments and researches have reflected such lustre upon the art of dental prosthesis, have excited my admiration as I have studied their complex operations, and if I have been enabled to extend their usefulness, and increase their value by substituting an imperishable material for the less excellent substances now in general use, I shall consider that the years of study I have given to this remote and rarely-considered problem of science have not been altogether without their reward.